"Remarks on the unequal distribution of Cancer"

A Thesis
for the
Degree of M. D. of
Glasgow University
by
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Prefatory Remarks.

I have always had a weirdish fascination for investigating Cancer- such a fatal and terrible form of disease and stronded in such obscurity; and have for the past seven years since graduating embraced every opportunity of acquiring further knowledge connected with the subject.

I intend in this Thesis rather to dwell specially upon the unequal distribution of the disease than enter into the different varieties of Cancer. I have been much struck during my holidays to dif—

ferent parts of this country to note the unequal distribution of the disease and consider this a very interesting and important subject to follow up My holidays have led me amongst other places to S. W. Norfolk and Cambridgeshire also to Bournemouth and district, more especially to Poole and immediate neighbourhood. It is in connection with the latter place I was particularly struck ~~at~~ the large number of cases of Cancer that came under my observation and naturally endeavoured to obtain as much information as possible as to the cause of this excess.

although we have excellent monographs, text-book descriptions and even manuals on the subject yet I consider our knowledge only crude as to the geographical distribution and most unequal prevalence of this disease.

I have been unable to find satisfactory explanations why it should be so common in such places as S. W. Norfolk or Poole district and on the other hand so rare in my own practice here in Glasgow and vicinity.

In the following thesis I have endeavoured to set forth what I consider the probable explanation in the present state

of our knowledge; at the same time I feel almost certain that our whole views on the subject will be demonstrated to be erroneous in a great measure at no very distant date.

The behaviour of Cancer like some of our Infections and Specific Diseases, in many of its attributes, as well as its highly probable contagiousness, seems a promising field for future research.

Before proceeding further with the consideration of "The unequal prevalence of Cancer", it is necessary to have an exact knowledge of what is meant by "Cancer". According to Quains Dictionary the word

Cancer is without histological meaning and along with its synonym — Carcinoma was used as long ago as the time of Hippocrates to designate any new growth of a malignant character. The definition I adopt however slightly differs from the above and is the one given by D. Williams in his Harveian Lectures (see Lancet Jan. 87) D. Williams thus defines the word — Cancer — "a new growth possessing malignant properties — that is possessing the power of invading neighbouring tissues and of reproducing itself in the form of secondary growths

in other and distant parts"

To distinguish such growths from others we make two kinds of observations ——

(1) Clinical

(2) Microscopic.

Clinical observations are sufficient if time is not limited; but it is to the microscope that we must look, for early recognition of the disease — long before it makes itself known clinically for certain.

Chapter I

Geographical.

The town of Poole where I was so struck at the prevalence of Cancer stands on an inlet of the sea at the South Eastern corner of Dorset. It is a very old place, good streets, clean and kept in order. The population is above 15.000 at present.

No part of the town itself is much above the sea level — in fact I may say, that it is essentially low lying, especially those parts marked blue in the accompanying

maps. Now from a glance at the maps it will be seen that the town is pretty well surrounded by water, at least on two out of the three sides.

This part of Poole-Bay is on an average, in the channels, about 12 feet deep, but out of the channels quite shallow. A sand-bar at the entrance of the harbour is the impediment. Fishing, shipping pottery works brewing, and timber trades give most employment.

The soil is fine, and black on the surface and the subsoil sandy. Being situated at such a low level this subsoil contains much ground

water, so it is essentially a damp town.

Summarily — Pole is a sea port, low lying, damp subsoil sheltered from prevailing winds by Purbeck & Corfe hills, mild climate, stationary population up to late years when it has much increased; formerly malarial; and owing to the sand-bar the vegetable and other refuse does not get always thoroughly scoured out of the harbour.

Now here I was amazed to note such an increase in Cancer compared with my own practice in Glasgow.

I am of opinion that

(1) Climate & Soil

(2) Heredity
(3) Intermarriage
(4) Contagiousness

the former especially, account for the geographical anomaly

Chapter II

Climate and Soil as influencing Cancer.

I will still keep to Poole as illustrating a typical cancer district.

Protected from the bracing winds from the North by the Corfe hills and open to Southerly winds coming over the bay. I find from observation and enquiry that generally speaking the climate tends to have a relaxing and moistening effect on the body. This is noticeable especially by a new comer.

The mean temperature from

observations by a gentleman is about 2° – 3° Fah higher than Greenwich during the Winter and about the same as Greenwich in Summer. The climate is a humid one as would be expected – not dry like its famous neighbour – Bournemouth. Fogs are rare, and sunshine is above the average. Winds are variable but prevailing ones are in direction of South West and West. Rain falls on about 150 days per year the average fall being about 30 inches.

The soil is poor – in fact the subsoil is sandy but owing to being nearly at sea level, it becomes charged

with ground water to an unusual height. There is no separate system of drainage - not even Brooks's Patent Subsoil Pipes to carry off this ground water, if such could be done at Poole.

My object in giving the above is to show that with such a climate, & soil, this locality possesses those very conditions which Haviland maintains give the highest death rate from this disease. To quote Havlands own words — "the group of high mortality (cancer) districts were coincident with low-lying areas, sheltered from the direct influence of the prevailing winds, and traversed

by fully formed rivers, which seasonally flood the tertiary post tertiary and alluvial adjacent riparian lands, after Autumnal and Winter rains or heavy snowstorms, such floods leaving behind them areas of dead vegetable matter which invariably undergoes decomposition rendering the soil sour and the subsequent vegetation rank and noxious to cattle sheep and horses"

Why can Haviland thus point out to certain spots and say they have a high Cancer mortality or vice versa?
Take Pasadena into climate and soil. I am inclined

to think that these tend to a lowered vitality of tissues — in fact to a poisoning of tissue health, giving a peculiar proclivity to Cancer before the actual development of the disease. This proclivity is that the lowered vitality in a low-lying district like Pool with its climate etc tends to hasten senility — a sort of second childhood of the tissues. It is well known that senility of tissues local or general is about the one predisposing cause of cancer with which all are acquainted

For example as Paget points out in his Morton Lectures of

1887" its frequency in the breasts and the uterus, before old age coincides with what may be deemed their early senile changes, when they cease to be capable of their proper functions"

Now in Poole out of 1600 members of Friendly Societies and widows of late members I was struck to have my attention drawn to the fact of 16 cases of undoubted Cancer or 1 in every 100. Three of the cases showed evidence of hastened tissue senility. These three were;-

(1) Cancer of tongue 8 Months duration aged 37 Years

(2) Cancer of lip and cheek 5-

months duration aged 36 years
(3) Cancer of lower jaw 5 months
duration aged 39 years..
It is very unusual thus to
have 3 cases out of a total 16
so young in years but old
in tissue growth.
Turning to my own practice
in Glasgow and following the
same train of reasoning I
expect to find a low Cancer
rate owing to the district
being one geologically and
meteorologically different
from the foregoing. viz – a
coal and carboniferous limestone
– a low rate obtaining; in
fact Cancer is rare.
In the midst of a busy
practice and coming in.

contact with quite a host of patients daily here in Glasgow, I must admit it is a very rare event to come across a case of Cancer indeed the two last cases that came under my notice so happened to hail from other parts, where the local conditions were conducive to Cancer & when the Cancer mortality actually stands very high viz – one from Leith, the other from South Shields

About five years ago I spent some time in Downham district in Norfolk and was there much struck with the large number of cancer cases that came under my

observation. Even at that time I was led strongly to suspect the intimate relations existing between the prevalence of Cancer and the nature of the soil to and felt specially interested a year or two afterwards to read Haviland's Lectures on the subject (see quotation page 15°); and since then have had the truth of this assertion frequently verified.

In Downham I was struck with the unusually large number of Cancer of the Liver cases occurring in that district. I have noticed that different districts vary in the predominance of a particular variety of cancer

For example in the valley of the Aire river in Yorkshire, there is relatively a very large number of cases of cancer of the breast. This is another phase in the endemicity of the disease. It would be very interesting and as instructive if in the different districts we had detailed statistics as to the relative frequency of cases affecting the different parts of the body. We could thus compare the different districts in this aspect, which might open up the way to a further appreciation of the question.

I am only sorry that during my stay at Downham I

did not take definite notes of my observations, as I meant to have returned to the place again, as that district specially affords a rare opportunity of useful investigations on the subject. On making enquiries when in Dawnham I was fully convinced of the mysterious connection between Cancer & soil etc, particularly on finding that places, comparatively close at hand, but under quite different soil conditions, had little cancer.

Turning to the South again - take Bournemouth, only 4 miles from Poole, quite a different geological stratum

obtains. It may be summed up as very fine gravel, with a deep subsoil of sand, extremely porous, dries quickly and being about 120 — 60 ft above the sea level, the ground water is low. Cancer here is rare, but perhaps the nervousness of the Race in part accounts for this, as well as the better geology.

Wimborne too — an old market town 6 miles from Poole (to the North) stationary population, although situated on the river Stour (certainly some distance up from its banks) — is very free from the disease; although the Stour valley is held to have a high

mortality rate from cancer
But the town and immediate
vicinity stand peculiarly on
a much higher level and
on a very porous soil.
(Dr A. T. A. Crespi writes; —
"Wimborne is comparatively
free from Cancer compared
with the low-lying districts
of Poole and neighbourhood.
Bournemouth likewise. In-
stead we have many cases
of Goitre" —)
I feel convinced that the soil
conditions dont only play a
mere passive part in con-
nection with Cancer but
develop some baneful agency
which enters the system
and in a mysterious manner

tends to the development of the disease; of course there must be a number of conditions required in order for the development thus of the disease, otherwise many more than are would be attacked by the disease. More will be said on this point however under the head "Contagiousness".

Chapter III

Heredity

Heredity plays an important part in the etiology of Cancer. The doctrine of descent is only as yet in its infancy notwithstanding the labours of Darwin, Wallace & others. In Cancer most cases we meet with have a history of heredity, as in many other diseases but it is so uncertain — in fact it is utterly impossible to predicate in a given man whose ancestor or ancestors were cancerous, whether he

will have the disease or not and what organ or tissue will be affected. Notwithstanding this uncertainty, the influence of hereditary predisposition is estimated as high as 1 in 4 by Paget — other writers variously.

Without enquiring into the laws of heredity let us endeavour to find out what it teaches us concerning the inheritance of disease — or rather to be strictly correct — of morbid processes whether functional or organic.

My views are on this so entirely in accordance with those expressed in "Lithgow's

Heredity" page 72, that I quote them in extenso:—
"As in general terms all that we have and are, we owe to heredity with the exception of the modifying influences to which we are subjected in the "struggle for existence" so as each of us has inherited a certain physical, mental, and moral constitution, whether healthy or otherwise, and differing from that of every other individual; it follows that this individual differentiation, physical, mental and moral predisposes us, each one more or less, to certain morbid processes and influences dif-

-fering in such as to symptoms intensity course and mode of termination, as in fact the physiological and psychological nature of every individual - inherited and acquired - differs from that of every other; so too must every individual differ from every other as to his pathological predisposition.

For example:- Disease germs pass into our body every day; but the soil must be suitable for them to germinate or they produce no effect; even when they do germinate the product varies according to the soil and as Sir James Paget says;

"The study of this soil – this living soil – is yet more necessary in respect of diseases which come in part or wholly by inheritance: for disease is in each as personal and distinct as any other constituent of personal character and the study of it must be intimately personal, with an exact analysis of every disposition to disease."

This brief quotation expresses my argument – most pithily, for if it means anything it surely means that the individuality of each human mind differs from that of every other, and that by reason of this individual dif-

perentration — inherited and acquired — may individual is variously affected by morbid processes and influences."

If then we are practically what our forefathers made us, plus the action of circumstances on ourselves, and if in like manner our children inherit morbid proclivities from us; therefore upon us rests the duty of seeing that the future of those with whom we are associated, suffers not at our hands.

Nowhere is this duty more imperious than in Cadenic localities — Cancerous districts such as Poole etc.

Here the best safeguard

against the disease is to insist upon those who are hereditarily predisposed to avoid all districts where the soil, climate, moisture of atmosphere and high ground water obtain as in their native place and advise them to seek high, dry, localities where there is absence of floods and rocky subsoil etc.

Out of the 16 cases I saw during my stay in Poole, 8 of them gave evidence of cancer in their family histories, one case I more especially noted.

Mrs B aged 77 widow. suffering from Scirrhous Cancer of breast, when I saw her

she complained of excessive pain of a stabbing character quatty disturbing sleep for 3 months; no movement of axillary glands; beside a cachectic look, sallow & anxious. Her medical man two months afterwards wrote to say that the breast had been operated upon, the operation proving highly satisfactory & that she had become fresh and hearty. The point in heredity in this case was — the womans daughter died 6 years before from Cancer of Cervix uteri in London 4 months after operation in Hospital (I can vouch for

accuracy of this from examination of letters and copy of death certificate shown). I may add that the daughter had a large family. The only explanation which seems to me satisfactory is that the sterility of the tissue in the daughter's case, was located in the uterus, due to the local irritation of child bearing, as an exciting cause, and led to the earlier development of the disease than in the mothers case.

From analogy with the Infective Fevers we might say that cancer in the case of the daughter had a short incubative period, whilst in

the mother's case the period of incubation was excessively long, before the period of manifestation.

Chapter IV

Intermarriage

This unquestionably predisposes to disease, and on the higher grounds of State Medicine, must ultimately deteriorate communities. A considerable percentage of intermarriages have turned out favourably so as rather difficult to lay down definite laws on the subject

In regard to serious diseases like Cancer; as children unquestionably resemble their parents in their constitutional peculiarities and the morbid

tendencies growing out of them, it is most advisable that intermarriage where the cancerous diathesis is on both sides, should not take place. If such marriages occur will not the hereditary transmission be earlier developed and intensified?

In Poole an old town with a stationary population we find many very large families of one name related to each other by marriage or otherwise.

The stationary habits of the people in many rural places naturally lead to intermarriage: just as in Poole we find marriages amongst-

families with cancerous history occurring. — I had my attention particularly drawn to a double instance of this: — Two sisters, belonging to a cutler family Pratt with a marked cancerous history (an aunt having recently died, and a brother at that time suffering from the disease) had husbands, each with an undoubted history of cancer in their family. Both have large young families one 11 the other 13. Now what will be result to those children if they continue to reside in such a place where local conditions obtain coincident with a high death rate from cancer? We cannot tell

for certain, but judging from the past and in the present state of our knowledge, we should expect that injuries and local irritations in the males would be sources of danger, past 40 years of age and in the females the uterus and two mammæ would tend to become senile between 35 and 45 years of age; thus greatly predisposing to the dread disease.

I am inclined to the belief that it is of great practical moment to be acquainted with facts as above stated; may further I think that patients themselves should be made intelligently ac—

granted also, with their individual peculiarities and so far as practicable be placed in a new and better environment.

This is now done in Phthisis, ere long we shall do the same thing in Cancer, when its geographical and endemical characteristics become more widely known.

Chapter V

Contagiousness of Cancer

By "contagiousness" we mean communication of disease from one body to another whether by means of actual contact or through a medium. Contagious diseases usually obey certain laws: —

(1) They invariably arise from a pre-existing disease of exactly the same essential nature.

(2) They run within certain limits a definite course.

(3) They have periods of incubation, development, height

and decline —
Accepting the above definition can we assert that Cancer can be included amongst Contagious Diseases?
We know that formerly it was held to be contagious but of late years this doctrine has rather been reckoned old fashioned. Erasmus Darwin held this belief; in his "Zoonomia" Vol II page 287, he says:— "Cancerous matter does not seem to acquire its malignant or contagious quality till the Cancer, becomes an open ulcer, and the matter secreted in it is thus exposed to the air, then it evidently becomes contagious" —

Isolated facts in favour of contagiousness if carefully gathered might throw much light on the subject. For instance Wynter Blyth quis two;- (1) a gentleman who suffered from cancer of the lip allowed a favorite dog to occasionally lick it; the dog died of cancer of the tongue (2) There is a house in the writer's district in which three successive tenents unconnected in any way, all died of cancer."

The alum is evidence at least of close affinity to contagiousness, if not actually so, between different bodies, analogous to the infectiveness

of the disease as seen in the same body. All Cancers in the same individual are infective, some by inoculation, all by invasion of adjacent parts, or by the absorption and transmission of materials to other and distant parts.

The following annotation from the Lancet of June 8. 1889

ALLEGED CONTAGIOUSNESS OF CANCER.

A SMALL commune in Normandy, Saint Sylvestre-de-Courcelles, with a present population of only 379, as compared with 500 twenty years ago, has in the eight years 1880–1887 lost no fewer than eleven of its inhabitants, between the ages of sixty-two and eighty-three, from cancer—a proportion of 15 per cent. of the total mortality. All but one of the cases were males, and in as many as eight the cancer was seated in the stomach. Such facts have led Dr. Arnaudet (*L'Union Méd.*, No. 52) to conclude that cancer is contagious, and is propagated through the medium of water. It is true, he remarks, that not one of the eleven persons mentioned were water drinkers, but then they drank cider, which is made with the pond water of the district. Dr. Arnaudet thinks this sufficient ground to advocate the use of antiseptics and of boiled water as prophylactics against cancer, as well as against typhoid fever or phthisis. ——

shows how the alleged con—

tagiousness of cancer has very recently attracted notice.
The presence of a specific virus in Cancer has not yet been definitely settled. If it could be isolated and we could regard Cancer as a separate genus of the infective diseases, with which it has a general likeness, then perhaps more evidence might be forthcoming as to its contagiousness.
Because the evidence up to the present can only be classed as "alleged" is no proof that it does not exist.
We can at least say that Cancer resembles the Specific Fevers in having a period of

development - an excessive one certainly, and a period of manifestation.

As an active practitioner I consider that whether the alleged contagiousness be proved or not, in the present state of doubt and uncertainty it would be better to act as if such were the case and supply disinfectants to every case of open cancer, as at present it would seem that such a step is not deemed necessary.

I doubt very much if cancerous products, coming in contact with an abraded surface of an individual - particularly one with a strong family

history of Cancer – would not prove a very possible means of communicating the disease to such an individual.

The researches of medical men in large towns into contagion or no contagion as regards Cancer must always be accepted with caution as liability to error increases with density of population, continual removal and influx or efflux owing to good or bad times. It is rather to the rural and small towns Medical officers of Health and to our "Army and Navy Medical officers that we must look for accurate

statistics and elucidation of this important subject. With this the answer to my question is completed.

Summarising :- I firmly believe so far as my own observations, at different places in the country with high Cancer mortality and also at low Cancer mortality districts, are concerned, that the excess of Cancer in the former districts is influenced by ; (1) Damp climate, nature of soil with its high ground water and non removal of deposits after floods etc. (2) Stationary Population (3) Heredity (4) Consanguinity and intermarriage of families of Cancerous hereditary tendencies

(5) Increased mental and physical strain in the struggle for existence (6) Contagiousness These combined increase the sum total of cases observed. Explain it as we may there can be no doubt but that within the last 30 years cancer has been steadily increasing amongst us. Now in Poole as previously stated, during a comparatively brief stay, I saw 16 cases of genuine cancer out of a membership of Friendly Societies and late members widows, of 1600. This is a very large number to occur in such a small community. The seats of the disease in

these cases were as follows:—

Epithelioma of Lip —— 3 cases
Cancer of Breast (1 male) — 3 .
Epithelioma of Tongue — 2 .
" " Cheek — 2 .
Cancer of Liver —— 2 .
Epithelioma in Ischio-rectal region 1 .
Villous Cancer of Bladder 1 .
Cervix Uteri —— 1 .
Huge Epithelioma of lower Jaw 1 .

In the bladder case the diagnosis has subsequently been confirmed by P.M.

Perhaps it would be as well for me to state that although I have carefully perused Dr. Churchills letter to Sir B. Hunniker, Registrar, General, I cannot accept his views as to the increase and

unequal prevalence of Cancer. Ingenious though his "phosphorus theory" undoubtedly is; in my opinion its luminosity fails to account for the increase; whether this is due to my obtuseness of perception or mental narrowness of viewing the disease as being influenced more by environment and humidity than by the somewhat doubtful substitution of phosphorus in excess, I cannot tell.

Chapter VI

Cancer Mortality

The registered mortality from cancer has steadily increased and in 1887 was nearly twice as great as that registered in 1851–60.

In 1851–60 the mortality from cancer in England and Wales per million living was 317. In 1887 the figure was 666. This increase has been quite steadily maintained as the following small table shows.

1851–60	1861–70	1871–80	1883	1885	1887
317	387	473	546	566	606

In Scotland the same increase obtains, as also in Ireland, the figures being practically the same. Part at least of this increase is only apparent, due to improved diagnosis and more careful statement of causes of death. This does not however explain the whole increase, some other explanation must be forthcoming. Again while Sanitary works, better drainage and water supply have considerably lessened general mortality and especially Phthisis, Cancer has more than held its own and especially in districts

with a death rate below the average. Also density of population has no influence on cancer mortality; the reverse obtains in my own practice in Glasgow here, where great density exists, there is a low cancer mortality, but in many cancer districts, which I have visited the density of population is very low and a very high cancer mortality prevails. In Dorchester - a poor law Union the death rate per million was; -

1851-60	1861-70
670	698

It is with regret that I cannot give later figures which would

show a further increase.
In Poole also I am sorry I am unable to obtain Vital Statistics
There appears to have been a greater increase in mortality of males than females from Cancer, as a comparison of rates in 1871–80 with those of 1851–60 will show.
I take the following table from Newsholme's "Vital Statistics" Page 208

Age Periods	Increase per cent	
	Males	Females
35-	39	35-
45-	68	39
55-	72	49
65-	74	50
75-	74	52

There is a much greater mortality of females than males in the British Isles: & beyond the fact that women have three organs — 2 breasts and the uterus peculiar to cancer, I cannot say I find any other evidence why this should be so. These organs certainly are prone to develop senility whilst their years are not many as stated before. The proportion per million living is as follows.

	1851–60	1861–70	1871–80
males	195	244	315
Females	434	523	622

There is little doubt speaking generally, but that in certain

localities a high rate obtains but in others a low rate.
Take Glasgow - according to Sir Spencer Wells Hutton Lectures (1888), the death rate from Cancer varied from 21 to 19 per 1000 deaths in different districts whilst in Edinboro the rate was 49 per 1000.
As yet no certain conclusions can be drawn from these mortality rates. Quoting Sir. Spencer Wells again, —
"In this country it would appear that although that the liability to death from Cancer advances rapidly with age, the characteristic feature of Cancer mortality

is not to increase with ad-
vance of years, for this it
shares with other fatal
affections, but to dispro-
portionate increase in the
middle periods of life."

Concluding Remarks

We are all fully aware that the victims of Cancer are too often men and women in the prime of life, the parents of families, and their death prematurely, quite apart from motives of humanity, may be easily shown to be a heavy loss to the community.

It is therefore clearly incumbent on us to observe and interpret geological and meteorological influences in the light of experience as far as we can.

My brief holidays from busy

Glasgow into England have been doubly enjoyable, thus rendered, by quietly enquiring into and investigating cancer at its "homes"; such mental ablocation has convinced me more than ever, that very many of our diseases are profoundly affected by endemic as well as by hereditary and other influences.

The reports of Dr. Buchanan of the L. G. B. on the influence of dampness of soil on Phthisis are only the beginning of what I believe will be important investigations, and that Cancer will eventually be found to have some relationship geologically, more

than we know at present.
On 10th May last Mr Ambrose
M. P. for Harrow put a question
I noticed to the President
of L. G. B, concerning the in-
creased mortality of Cancer
but received as I thought
a very indefinate answer.

More than fifty years
ago Dean Buckland in his
Bridgewater Treatise on
Geology said;- "It appears
that the numerical amount
of our population, their varied
occupations, and the funda-
mental sources of their in-
dustry and wealth, depend in
a great degree upon the
geological character of the
strata on which they live

their physical condition also, as indicated by the duration of life and health, is directly affected by the geological causes."—

Before concluding I must refer to the recent work on "The Causation of Disease" by D. Hamp Campbell on page 332 he says:—

"The environment is in the last resort the sole cause of the disease. This will be clear if we keep before us the formula — Structure + Environment = Disease —

If it can be shown that structure is the outcome of structural modification, wrought through the environment, then it becomes obvious

that structure + environment; or disease, is produced by the environment, and by the environment alone."—

Apply this reasoning, quoted from the most recent and elaborate work on Etiology, to my own views as before enunciated, how do they agree?

I have said that Heredity plays an important part in Cancer causation, and that Paget says it has been found by him in 1 out of 4 cases.

I believe that all the varieties of Cancer are even of a more frequently hereditary taint than this; and that on careful enquiry, some pre-examples of Cancer of

some variety will be found, although the disease, occasionally may have skipped a generation. Many examples with the inherited tendency, who live in localities which have the least mortality from cancer (such districts as Haviland describes as having the "hardest and most elevated rocks, or the most absorbent, like the oolite and chalk") may and often do die off before the peculiar taint whatever it may be, has had any exciting injury or shock to call it into action.

Three problems of extreme difficulty here present themselves: (1) How many

generations of an original family living in a healthy district, with hereditary predisposition undeveloped are required before the tendency will be multiplied in its new environments?

(2) Can a powerful exciting external cause, per se, produce Cancer in a healthy organism; or must there be some predisposing cause, heredity; or consanguinity or endemicity or contagiousness in order to produce the disease?

(3) Can normal physiological action be the exciting cause of Cancer independently of any directly injurious external agent?

at present modestly and with
many reserve I must say that
Campbell's general formula
appears to be true as regards
Cancer, in so far that the
structure probably must
have some susceptibility,
some weakness, ere environment can produce the
disease. So we might
modify slightly his and
make our formula; —
Structure (susceptible) + environment
= Disease (Cancer).
Statistics carefully collected
and arranged into sexes and
age periods; correct diagnosis
duplicates; a correct appreciation by all medical men
of the great importance of

the causes, origin, and distribution of cancer cases under their care, will all materially help us to cope with the dread and increasing disease. On the whole we must look upon the unequal distribution of cancer as a subject to be dealt with in the near future, and that with the appointment by our County Councils of specially trained and qualified consulting Medical officers of Health, better information will be forthcoming.

Registrable facts bearing on the disease and mortality; all the facts relating to soil, meteorology and climate; on

intelligent- appreciation of family history by the people themselves; are all of the greatest importance and powerful helps in trying to solve this hard problem —

Without indulging in any fancy theories I am convinced that most of the mystery enshrouding Cancer will be cleared up on the above lines, but much requires to be done before we can stay. the mysterious menace of this disease.

I have endeavoured to state what I consider to be what is of greatest importance when brought into contact with this disease, and which

at the present time seems to be in danger of being over-looked. We are apt to forget environment at any rate and collateral heredity or atavism or possible contagiousness in looking clinically at a cancer Patient.

In the discharge of our duty towards our patients, such facts as I have set forth ought to duly influence our judgment in the future and help us to benefit our fellow creatures and minister in a large degree to their comfort, as well as, on the larger scale, place those with individual

susceptibilities into an environment where they will be the least likely to transmit their cancerous pathological bias to their offspring and where this bias will perish for lack of equilibrium.

In drawing my outline I have studiously avoided many points of detail and also all mention of the varities of Cancer; instead I have endeavored to discover a principle for the better understanding of its unequal distribution, and in conclusion trust that this Thesis may be considered rather as a rude sketch

of a Zealous individual
ansciows to indicate the
particular lines on which
subsiquent elaboration
may hereafter be more
accurately and effectively
worked out. —

5 W. Princes St.
Glasgow.
19. June. 1889

I hereby certify that the accompanying Thesis on the Unequal Distribution of Cancer is entirely of my own composition, and where I have made any quotation, have duly noted the source.

James Dodds
M.B.C.M.